PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : A01N 25/24, 53/00

A1

(11) International Publication Number: **WO 00/03593**

(43) International Publication Date: 27 January 2000 (27.01.00)

(21) International Application Number: PCT/IB99/01405

(22) International Filing Date: 14 July 1999 (14.07.99)

(30) Priority Data:

60/093,221	17 July 1998 (17.07.98)	US
09/228,737	12 January 1999 (12.01.99)	US

(71) Applicant: MAGISEAL CORPORATION [CA/CA]; 1065 Clarke Road, London, Ontario N5V 3B3 (CA).

(72) Inventors: HARRIS, James, T.; 320 St. George Street, London, Ontario N6A 3B1 (CA). TANGELDER, Bernardus, M.; 180 Ardsley Crescent, London, Ontario N6G 3W7 (CA).

(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: FABRIC, CARPET AND UPHOLSTERY PROTECTANT WITH BIOCIDE AND ACARICIDE

(57) Abstract

A composition for treating a substrate to control dust mite populations thereon. The composition includes a fluoropolymer, a biocide, and an acaricide.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

FABRIC, CARPET AND UPHOLSTERY PROTECTANT WITH BIOCIDE AND ACARICIDE

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefits of U.S. Provisional Application No. 60/093,221, filed July 17, 1998.

BACKGROUND OF THE INVENTION

This invention relates to compositions for treating substrates, and in particular to compositions for treating substrates to control dust mites.

Allergies to dust are common in the U.S. and Western European countries. Many of these allergies are caused by allergens produced by acarids present in dust, such as *Dermatophagoides farinae*, *Euroglyphus maynei*, and *Dermatophagoides pteronyssinus*. Such acarids are commonly referred to as "dust mites". Two types of allergens are produced by dust mites: Group I allergens, which are released by dust mites via fecal pellets, and Group II allergens which are present in the bodies of the dust mites. It has been determined that the threshold level for dust mite allergen sensitization is about 100-500 mites/gram.

It is known that dust mites derive their nourishment from the dead skin, nail debris, fur, and feathers of humans and animals (often collectively referred to as "squamae"). Mold provides dust mites with vitamins, which helps the dust mites digest squamae. Thus, dust mites live in areas where abundant amounts of squamae can be found, where the temperature is warm, where the humidity is relatively high, and where there is little light (because dust mites are sensitive to solar UV). Consequently, dust mites thrive in substrates that have prolonged contact with humans, e.g., bedding, upholstered furniture, and carpets.

Acaricidal compositions have been developed to treat substrates. Typically, acaricidal compositions include an acaricide and a carrier, such as water or an organic solvent. These acaricidal compositions poison dust mites, but do not reduce environmental conditions that are favorable to dust mites, such as high humidity and abundant food supplies.

Based upon the foregoing, there is a need in the art for a composition for treating substrates to control dust mites, wherein the composition reduces environmental conditions favorable to dust mites. The present invention is directed to such a composition.

SUMMARY OF THE INVENTION

It therefore would be desirable, and is an advantage of the present invention, to provide a composition for treating substrates to control dust mites, wherein the composition reduces environmental conditions favorable to dust mites. In accordance with the present invention, the composition includes a fluoropolymer, a biocidally effective amount of a biocide, and an acaricidally effective amount of an acaricide. Also provided in accordance with the present invention are methods of treating substrates to control dust mites. The methods include the step of applying a composition to the substrate. In one embodiment, the composition includes a fluoropolymer and an acaricidally effective amount of an acaricide. In another embodiment, the composition includes a biocidally effective amount of a biocide, and an acaricidally effective amount of an acaricide.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

It should be noted that parts are parts by weight and percents are weight percents unless otherwise indicated or apparent. In addition, when a preferred range such as 5-25

is given, this means preferably at least 5 and preferably not more than 25.

As used herein, the term "acaricide" shall mean a material that kills or materially inhibits the growth, reproduction, or spread of acarids, including but not limited to dust mites. An "acaricidally effective amount" of an acaricide is that amount that will kill or materially inhibit the growth, reproduction or spread of a significant number of acarids.

As used herein, the term "biocide" shall mean a material that kills or materially inhibits the growth, division, reproduction, or spread of microorganisms, such as bacteria, algae, and fungi. A "biocidally effective amount" of a biocide is that amount that will kill or materially inhibit the growth, division, reproduction, or spread of a significant number of microorganisms.

As used herein, the term "fluoropolymer" shall mean any polymer, copolymer, or mixture of polymers, wherein some or all of the hydrogens are replaced with fluorine.

As used herein, the term "powderizing agent" shall mean a material that operates as an inert carrier to render a liquid into a solid.

Preferably, the composition of the present invention is in liquid form and is organic solvent-based. Less preferably, the composition is in liquid form and is water-based. Still less preferably, the composition is in powder form.

The preferred formulation (Formulation 1) for the organic solvent-based embodiment of the composition is as follows:

	Weight Percent		
Component	Preferred	Less Preferred	Less Preferred
1. Polymer A	7.55	5 - 15	.1 - 20
2. Biocide	.25	.05 - 1	.001 - 5
3. Acaricide	.1	.05 - 3	.01 - 10

4. Solvent A	92.1	81 - 94.9	65 - 99.88

The preferred formulation (Formulation 2) for the water-based embodiment of the composition is as follows:

Weight Percent

Component	Preferred	Less Preferred	Less Preferred
1. Polymer B	2.9	2-15	.1 - 20
2. Biocide	.25	.05 - 1	.0001 - 5
3. Acaricide	.1	.05 - 3	.01 - 10
4. Surfactant A	1.3	.5 - 5	.1 - 10
5. Glycol ether A	2.5	.5 - 5	.1 - 10
6. Glycol ether B	2.5	.5 - 5	.1 - 10
7. Water	90.45	66 - 96.4	35 - 99.5899

The preferred formulation (Formulation 3) for the powder embodiment of the composition is as follows:

Weight Percent

Component	Preferred	Less Preferred	Less Preferred
1. Polymer A	7.55	5 - 15	.1 - 20
2. Biocide	.25	.05 - 1	.01 - 2
3. Acaricide	.1	.05 - 3	.01 - 10
4. Powderizing Agent	92.1	81 - 94.9	69 - 99.88

Preferably, polymers A and B prevent water and other polar and non-polar liquids and soils from penetrating the substrate to which the composition of the present invention is applied, and also prevent the biocides A and B and the acaricide from being removed from the substrate by water and other liquids. The polymers A and B preferably reduce the surface energy of the substrate to 16-30 dynes/cm.

This low surface energy prevents water and most oils from wetting or spreading over or into the substrate. It is believed that the low surface energy also helps prevent soil, such as squamae, from adhering to the substrate. Thus, the polymers A and B preferably keep the substrate clean and dry, thereby making the substrate less suitable for hosting dust mites.

Preferably, polymer A is a perfluorinated polymer sold under the name Bartex AF NF by TriTex. Polymer B is preferably a perfluoroalkyl methacrylic copolymer sold under the name Zonyl 8740 by E.I. Du Pont de Nemours. Less preferably, polymers A and B are fluorinated or perfluorinated acrylics, methacrylics, styrenes, or polyethylenes, or other type of fluoropolymers. Still less preferably, polymers A and B are silicone polymers, such as polymethylhydrosiloxane. Still less preferably, polymers A and B are any other polymer, copolymer, or mixture of polymers that provides a water resistant coating.

Preferably, the biocide is active against a broad spectrum of organisms, including Gram negative and Gram positive bacteria, and fungi. It is also preferred if the biocide is not irritating to human skin, is not readily deactivated by soil load, and is compatible with water repellent polymers, such as fluoropolymers. The biocide preferably reduces and prevents the growth of mold, fungi, bacteria, and algae, which are potential food sources for dust mites.

The biocide is preferably didecyldimethylammonium chloride, which is a quaternary ammonium compound sold by Lonza UK Ltd. under the name Bardac 22. Less preferably, the biocide is another quaternary ammonium compound, such as: benzyl trimethyl ammonium chloride, which is sold by Rhodia under the name DMB 451; didecyldimethylammonium chloride, which is sold by the Stepan Company under the name BTC 1010; benzalkonium chloride, which is sold by Bayer AG under the name Zephirol; benzethonium chloride, which is sold by Lonza under the name Hyamine 1622; a dual

quaternary ammonium compound, such as a mixture of myristalkonium chloride and quaternium 14, which is sold by the Stepan Company under the name BTC 2125; or 3-(Trimethoxysilyl)-propyldimethyloctadecyl ammonium chloride. Less preferably the biocide is a mixture of a quaternary ammonium compound with a phenolic compound, wherein the weight ratio of the quaternary ammonium compound to the phenolic compound is from 1:1 to 3:1. Still less preferably, the biocide is a phenolic compound. Phenolic compounds that may be used include ortho-phenylphenol and its sodium salt, which are respectively sold by Dow Chemical under the names Dowicide 1 and Dowicide A; and pentachlorophenol, which is sold by Dow Chemical under the name Dowicide 7. Still less preferably, the biocide is an isothiazolin, such as 2-octyl-4-isothiazolin-3-one, which is sold by Rohm and Haas under the name Kathon 893; or 2-bromo-2-nitropropane-1, 3-diol, known as bronopol, and sold by the Angus Chemical Company and the Inolex Chemical Company. Still less preferably, the biocide is another known biocide.

Preferably, a biocidally effective amount of the biocide is used in the organic solvent-based composition of the present invention and in the powder-based composition of the present invention. Preferably, a biocidally effective amount of the biocide is also used in the water-based composition of the present invention.

Preferably, the acaricide significantly reduces, and/or prevents an increase in, the number of dust mites present in or on the substrate to which the composition of the present invention is applied. It is also preferred if the acaricide is not irritating to human skin, is compatible with water repellent polymers, such as fluoropolymers, and is effective for an extended period of time, e.g. three years or longer.

Preferably, the acaricide is 3-phenoxybenzyl (1 RS, 3RS)-(1 RS, 3 SR)-3-(2,2-dichlorovinyl)-2,2-dimethyl-cyclopropanecarboxylate, CAS Registry Number 52645-53-1,

which is a synthetic pyrethroid known as permethrin and is sold by McLaughlin Gormley King Company. Less preferably, the acaricide is benzyl benzoate, or another pyrethroid, such as an allethrin, bioresmethrin, cypermethrin, cyhalothrin, deltamethrin, or natural pyrethrum. Still less preferably, the acaricide is another known acaricide.

Preferably, an acaricidally effective amount of the acaricide is used in the organic solvent-based composition of the present invention and in the powder-based composition of the present invention. Preferably, an acaricidally effective amount of the acaricide is used in the water-based composition of the present invention.

The solvent A functions as a carrier in the organic solvent-based composition of the present invention. The solvent A dissolves polymer A, the biocide, and the acaricide and carries them onto the substrate. Once the composition is deposited on the substrate, the solvent A quickly evaporates and leaves no residue behind.

Solvent A is preferably an isoparaffinic solvent sold by the Exxon Chemical Company under the name Isopar G. Less preferably, solvent A is an alkane, such as hexane, or heptane; kerosene; mineral spirits; an alkyl benzene, such as toluene, or xylene; an ester, such as ethyl acetate; a hydrofluorocarbon, such as 1-H-perfluorohexane; a fluorether; or another known aromatic, halogenated, or aliphatic solvent.

Water functions as a carrier in the water-based composition of the present invention. Surfactant A solubilizes the biocide and the acaricide into the water, while the glycol ether A and the glycol ether B help to solubilize the polymer B into the water. Once the composition is deposited on the substrate, the water evaporates, leaving the surfactant A on the substrate. Without being limited by theory, it is believed that the residual surfactant traps soil onto the substrate and reduces the efficacy of the polymer B. Accordingly, it is

important to minimize the amount of surfactant A used in the composition.

Preferably, the surfactant A is a surfactant comprising 2,6,8-trimethyl-4-nonanol with ethylene oxide, which is sold by Union Carbide under the name Tergitol TMN-6. Less preferably, surfactant A is another alcohol alkoxylate, an alkyl phenol alkoxylate, a glucoside, a sorbitan, a block polymer, an amine oxide, an amphoteric surfactant, a quaternary ammonium composition, an anionic surfactant, or a polymeric surfactant. Still less preferably, surfactant A is another known surfactant.

Glycol ether A is preferably dipropylene glycol monomethyl ether, which is sold by Dow Chemical under the name Dowanol DPM. Glycol ether B is preferably dipropylene glycol monobutyl ether, which is sold by Dow Chemical under the name Dowanol DPnB. Less preferably, glycol ethers A and B are other glycol ethers. Still less preferably, the glycol ethers A and B may be replaced with alcohols.

The powderizing agent functions as a carrier in the powder-based composition of the present invention. The powderizing agent renders the polymer A, the biocide, and the acaricide into a solid. Preferably, the powderizing agent is talc, sodium sulfate, sodium carbonate, calcium carbonate, or other carbonate. Less preferably, the powderizing agent is another known powder carrier.

Polymer A, the biocide, the acaricide, and solvent A are blended together using customary and known methods to form the organic solvent-based composition of the present invention. Preferably, the temperature during blending is maintained at ambient temperature, i.e., @ 70°F.

Polymer B, the biocide, the acaricide, surfactant A, glycol ether A, glycol ether B, and the water are blended together using customary and known methods to form the water-based composition of the present invention. Preferably, the temperature during blending is maintained at ambient temperature, i.e., @ 70°F.

Polymer A, the biocide, the acaricide, and the powderizing agent are blended together using customary and known methods to form the powder-based composition of the present invention. Preferably, the temperature during blending is maintained at ambient temperature, i.e., @ 70°F.

Preferably, the organic solvent-based and water-based compositions of the present invention are applied to a substrate using a pump-type sprayer. Less preferably, an aerosol sprayer may be used, which is typically in the form of a steel can. Aerosol propellants, such as isobutane, or CO_2, are used in the aerosol sprayer to dispense the organic solvent-based and water-based compositions. Known corrosion inhibitors may also be included to prevent corrosion of the steel can.

The powder-based composition of the present invention may be applied to a substrate from a bottle, box, can, or other container, which is preferably provided with a dispenser, such as a grate, or a plurality of apertures. The powder-based composition is applied by shaking, sprinkling, and/or rubbing the powder composition into the substrate.

The composition of the present invention may be used on any substrate upon which, or within which dust mites may be disposed, or through which dust mites may pass. Such substrates include, but are not limited to, textile fibers (or filaments), fabrics, clothing, carpets, rugs, upholstery, furniture, bedding, mattresses, pillows, curtains, and couches.

The composition of the present invention provides many advantages. When applied to a substrate, the composition kills dust mites that are already present on the substrate, as well as dust mites that later contact the substrate. In addition, the composition keeps the substrate clean and dry, and kills bacteria and fungi, thereby reducing food sources available to dust mites, which helps reduce the population of dust mites already present on the substrate

and discourages migration of dust mites to the substrate. In this manner, the composition is both reactive and preventative in terms of controlling dust mites.

The following Examples further illustrate various aspects of the invention. Unless otherwise indicated, the ingredients are combined using methods known in the art or as described above.

Example 1

A test was performed to measure the efficacy of the organic solvent-based and water-based compositions of the present invention in controlling *Dermatophagoides farinae* (commonly known as the "American house dust mite") on a carpet substrate.

An organic solvent-based composition was prepared in accordance with Formulation 1 by blending 7.55 parts of Bartex AF NF (perfluorinated polymer), 0.1 parts of Dowicide 1 (orthophenyl phenol), 0.1 parts of permethrin, and 92.25 parts of Isopar G (isoparaffinic solvent). The composition with the foregoing formulation shall be referred to in this Example 1 and in Examples 2 and 3 as the "Solvent Inventive Composition".

A water-based composition was prepared in accordance with Formulation 2 by blending 2.9 parts of Zonyl 8740 (perfluoroalkyl methacrylic copolymer), 0.1 parts of Dowicide A (sodium-orthophenyl phenol), 0.1 parts of permethrin, 1.3 parts of Tergitol TMN-6 (2,6,8-trimethyl-4-nonanol with ethylene oxide), 2.5 parts Dowanol DPM (dipropylene glycol monomethyl ether), 2.5 parts Dowanol DPnB (dipropylene glycol monobutyl ether), and 90.6 parts water. The composition with the foregoing formulation shall be referred to in this Example 1 and in Examples 2 and 3 as the "Aqueous Inventive Composition".

Three sections of carpet were selected. Each section of carpet was the same style and color, and had a size of about 23 inches by 46.5 inches. The sections of carpet were new and not treated with any stain blockers. Using

spray bottles, the Solvent Inventive Composition was applied to a first one of the sections, the Aqueous Inventive Composition was applied to a second one of the sections, and a control consisting of water was applied to a third one of the sections. The application rates for each of the compositions was about 20.97 ml per ft^2. Following the application of the compositions to the sections, each of the sections was rubbed with a plastic sheet to assure proper coverage. The sections were then allowed to dry for a period of 24 hours.

After drying, the backing of each of the sections was marked with grid lines to make numbered squares that would fit into 15 x 60 mm petri dishes. Three squares from each of the sections were randomly selected using a random number generator. The carpet squares were then cut from the sections to provide a total of nine squares, three from each section. The three squares from each section constituted a "sample" of the composition applied to the section.

Each square was placed in a petri dish and inoculated with 40 adult American house dust mites. In each square, the mites were innoculated in the center of the square using a fine (000) brush. The petri dishes containing the squares were then covered with paraffin lids and placed in humidity chambers. The petri dishes containing the squares were maintained in the humidity chambers at a relative humidity of about 75% and at room temperature, i.e., about 70-75°F, for 96 hours.

After the 96 hour period, the acute mortality of the American house dust mites in each sample was assessed using a "heat escape procedure", wherein the petri dishes were inverted (with paraffin lids facing down) and placed under a 100 watt light source, such that the heat (@ 108°F) generated by the light source would drive alive mites to the paraffin lids. The surfaces of the paraffin lids were then examined and the number of alive mites counted. This heat escape procedure was performed a total of three times

on each petri dish of the sample, with a new paraffin lid being used for each procedure. The squares in each petri dish were then microscopically examined for mites. Mites were scored as dead if they failed to move one body length in response to gentle brushing. Mortality values were then expressed as mean mortality for the three squares in the sample, ± standard error margin (SEM).

A t-test of proportions was performed to compare mortality between the samples of the Solvent Inventive Composition, the Aqueous Inventive Composition, and the negative control. When the mortality of the house dust mites in the samples of the Solvent Inventive Composition, the Aqueous Inventive Composition, and the negative control were compared by the studentized t-test of proportions ($P<0.05$), it was shown that the Solvent Inventive Composition and the Aqueous Inventive Composition provided significantly different results from the negative control and each other. The results of the test were as follows:

	Mortality, %
Solvent-Based Inventive Composition	100 ± 0.0
Water-Based Inventive Composition	72.5 ± 5.2
Negative Control	10.8 ± 0.8

As shown by the above results, the Solvent Inventive Composition and the Aqueous Inventive Composition both provide effective control of dust mites. The Solvent Inventive Composition provides especially good dust mite control, having killed all of the dust mites in the sample, which was a surprising and unexpected result.

Example 2

A water repellency test was performed to measure the efficacy of the organic solvent-based and water-based compositions of the present invention in repelling water.

The test was performed in accordance with a modified version of the American Association of Textile Chemists and Colorists (AATCC) Test Method 22-1989 Water Repellency; Spray Test. Water repellency is defined by the AATCC as the characteristic of a fibre, yarn, or fabric to resist wetting.

The Solvent Inventive Composition was applied to a piece of untreated cotton fabric, and the Aqueous Inventive Composition was applied to another piece of cotton fabric. Water was poured over the pieces of cotton fabric, and their repellency was then evaluated. No sticking or wetting of the upper surfaces of the pieces of cotton fabric was observed.

As shown by the above results, the application of the Solvent Inventive Composition and the Aqueous Inventive Composition to substrates renders the substrates water repellant.

Example 3

An oil repellency test was performed to measure the efficacy of the organic solvent-based and water-based compositions of the present invention in repelling oil. The test was performed in accordance with AATCC Test Method 118-1992 Oil Repellency; Hydrocarbon Test. The test utilizes standard test liquids consisting of a series of hydrocarbons with varying surface tensions.

The Solvent Inventive Composition was applied to a piece of cotton fabric, and the Aqueous Inventive Composition was applied to another piece of cotton fabric. Drops of the test liquids were applied to each piece of cotton fabric. After each drop of test liquid was applied to a piece of cotton fabric, the piece of cotton fabric was observed for wetting, wicking, and contact angle. The piece of cotton fabric was then given a grade number, which was the highest number test liquid that did not wet the piece of cotton fabric. Grade 0 is the lowest oil repellency, while grade 8 is the highest oil repellency.

The piece of cotton fabric to which the Solvent Inventive Composition was applied was given a grade number of 6, while the piece of cotton fabric to which the Aqueous Inventive Composition was applied was given a grade number of 2. Grade 6 corresponds to n-decane, while grade 2 corresponds to a mixture of 65 volume percent of liquid paraffin and 35 volume percent of n-hexadecane.

As shown by the above results, the application of the Solvent Inventive Composition to a substrate will cause the substrate to repel most oils. The application of the Aqueous Inventive Composition to a substrate will cause the substrate to repel some oils.

Example 4.

A test was performed to measure the efficacy of the organic solvent-based composition of the present invention in controlling bacteria.

A plurality of organic solvent-based compositions, S1-S7, were prepared in accordance with Formulation 1 by blending 7.55 parts of Bartex AF NF (perfluorinated polymer), 0.1 parts of permethrin, 0.1 parts Dowicide 1 (ortho-phenylphenol), and varying amounts of Bardac 22 (didecyldimethylammonium chloride) and Isopar G (isoparaffinic solvent). The varying weight percents of Bardac 22 and Isopar G for the compositions were as follows:

Composition	Bardac 22	Isopar G
S1	0.0	92.25
S2	0.009	92.241
S3	0.019	92.231
S4	0.038	92.212
S5	0.075	92.175
S6	0.15	92.10
S7	0.3	91.95

A 0.5 m^2 sample of untreated, cotton-based upholstery fabric was cut into a plurality of 20mm X 20mm samples. Thirty-five samples were used in the test, a set of five

samples being used for each composition. Each set of samples was immersed in its respective composition for approximately 5 minutes. The sets of samples were then removed and allowed to drain on an inclined surface. The sets of samples were then transferred to sterile petri dishes and allowed to stand overnight in a fume extraction cabinet to dry thoroughly.

Three samples from each set were selected at random and placed onto the surface of a Malt Extract Agar plate. Thus, seven plates, with three samples in each plate were used, one plate being used for each composition. Each of the plates was then inoculated with an aliquot (100 μl spread uniformly over both the plate and the samples) of a spore suspension of *Penicillium pinophylum* (IMI 114933: ca 10^7 spores per ml). The plates were then incubated at 24°C for 5 days. The plates were then inspected for growth, with the following results:

Comp.	Growth
S1	samples virtually overgrown
S2	samples partially overgrown
S3	some surface growth on samples
S4	surface growth restricted to edges of samples
S5	little surface growth, slight zone of inhibition
S6	no surface growth, moderate zone of inhibition
S7	no surface growth, significant zone of inhibition

As shown by the above results, the organic solvent-based composition of the present invention has good biocidal properties, which helps reduce food sources available to dust mites.

While the invention has been shown and described with respect to particular compositions thereof, those compositions are for the purpose of illustration rather than limitation, and other variations and modifications of the specific compositions herein described will be apparent to those skilled in the art, all within the intended spirit and scope of the invention. Accordingly, the invention is not to be limited in scope and effect to the specific

compositions herein described, nor in any other way that is inconsistent with the extent to which the progress in the art has been advanced by the invention.

WHAT IS CLAIMED IS:

1. A composition for treating a substrate to control dust mites, said composition comprising a fluoropolymer, a biocidally effective amount of a biocide, and an acaricidally effective amount of an acaricide.

2. The composition of claim 1, wherein the acaricide is a pyrethroid.

3. The composition of claim 2, wherein the acaricide is permethrin; and

wherein the biocide is didecyldimethylammonium chloride.

4. The composition of claim 3, wherein the fluoropolymer is perfluorinated.

5. The composition of claim 1, further comprising an organic solvent.

6. The composition of claim 1, wherein the biocide is a quaternary ammonium compound and the biocidally effective amount is about .05 to about 1 weight percent of the composition.

7. The composition of claim 6, wherein the acaricide is a pyrethroid and the acaricidally effective amount is about .05 to about 3 weight percent of the composition.

8. The composition of claim 7, further comprising about 81 to about 94.9 weight percent isoparaffinic solvent; and

wherein the fluoropolymer comprises about 5 to about 15 weight percent of the composition.

9. The composition of claim 1, further comprising about 66 to about 96.4 weight percent water, about .5 to about 5 weight percent surfactant, and about 1 to about 10 weight percent glycol ether.

10. The composition of claim 9, wherein the biocide is a quaternary ammonium compound and the biocidally effective amount is about .05 to about 1 weight percent of the composition.

11. The composition of claim 10, wherein the acaricide is a pyrethroid and the acaricidally effective amount is about .05 to about 3 weight percent of the composition.

12. A composition for treating a substrate to control dust mites, said composition comprising about .1 to about 20 weight percent of a fluoropolymer, about .001 to about 5 weight percent of a quaternary ammonium compound, and about .01 to about 10 weight percent of a pyrethroid.

13. The composition of claim 12, wherein the fluoropolymer is a perfluorinated polymer.

14. The composition of claim 13, wherein the quaternary ammonium compound is didecyldimethylammonium chloride.

15. The composition of claim 14, wherein the pyrethroid is permethrin.

16. A method of treating a substrate to control dust mites, said method comprising the step of applying a composition to the substrate, wherein the composition comprises a fluoropolymer and an acaricidally effective amount of an acaricide.

17. The method of claim 16, wherein the composition is in liquid form.

18. The method claim 16, wherein the composition is in powder form.

19. The method of claim 16, wherein the composition further comprises a biocidally effective amount of a biocide.

20. The method of claim 19, wherein the acaricide is permethrin.

21. The method of claim 20, wherein the biocide is didecyldimethylammonium chloride.

22. The method of claim 16, wherein the composition further comprises an isoparaffinic solvent.

23. The method of claim 16, wherein the composition further comprises water.

24. The method of claim 22, wherein the acaricidally effective amount of acaricide is about .05 to about 3 weight percent of the composition, the biocidally effective amount of biocide is about .05 to about 1 weight percent of the composition, the fluoropolymer comprises about 5 to about 15 weight percent of the composition, and the isoparaffinic solvent comprises about 81 to about 94.9 weight percent of the composition.

25. The method of claim 23, wherein the acaricidally effective amount of acaricide is about .05 to about 3 weight percent of the composition, the biocidally effective amount of biocide is about .05 to about 1 weight percent of the composition, the fluoropolymer comprises about 2 to about 15 weight percent of the composition, and water

comprises about 66 to about 96.4 weight percent of the composition.

26. A method of treating a substrate to control dust mites, said method comprising the step of applying a composition to the substrate, wherein the composition comprises a biocidally effective amount of a biocide, and an acaricidally effective amount of an acaricide.

27. The method of claim 26, wherein the composition further comprises a fluoropolymer.

28. The method of claim 27, wherein the biocide is a quaternary ammonium compound and the biocidally effective amount is about .05 to about 1 weight percent of the composition; and

wherein the acaricide is permethrin and the acaricidally effective amount is about .05 to about 3 weight percent of the composition.

INTERNATIONAL SEARCH REPORT

Int. ational Application No
PCT/IB 99/01405

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A01N25/24 A01N53/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	WO 97 24484 A (SOGILO) 10 July 1997 (1997-07-10) page 3, line 16 -page 5, line 17 claims 1-8	1,2,4,5, 9,16-28 3,6-8, 10-15
X Y	US 5 916 917 A (JANETTE SUH ET AL.) 29 June 1999 (1999-06-29) column 4, line 65 -column 9, line 40 example 1	26 3,6-8, 10-15

-/—

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 November 1999	30/11/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Fort, M

1

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Int. ational Application No
PCT/IB 99/01405

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DATABASE WPI Derwent Publications Ltd., London, GB; AN 1997-209183 XP002123254 KAO CORPORATION: "Household insecticidal compsn.-contains quaternary ammonium salt, and insecticide e.g. pyrethroid" abstract & JP 09 059109 A	26
X	DATABASE WPI Derwent Publications Ltd., London, GB; AN 1986-116639 XP002123255 SANYO MOKUZAI BOFU KK: "Insecticidal and ant controlling compsn. contg. phosphate and/or pyrethroid insecticide and amine cpd. and/or quat. ammonium cpd." abstract & JP 61 057506 A	26
A	DE 42 31 010 A (VERLIEBTER ET AL.) 17 March 1994 (1994-03-17)	

1

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int ational Application No
PCT/IB 99/01405

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9724484 A	10-07-1997	BE 1009900 A	07-10-1997
		AU 1361897 A	28-07-1997
		CZ 9702697 A	18-02-1998
		DE 29622338 U	13-03-1997
		EP 0812372 A	17-12-1997
		ES 2113328 A	16-04-1998
		FR 2742977 A	04-07-1997
		JP 11501246 T	02-02-1999
		NL 1004907 C	19-01-1999
		NL 1004907 A	02-07-1997
		NO 973939 A	27-08-1997
		NZ 325161 A	23-12-1998
US 5916917 A	29-06-1999	NONE	